U.S. Department of Energy's
Office of Science

Fusion Energy Sciences Program

Fusion Energy Sciences Advisory
Committee Meeting

Excellent Science
Attractive Energy
Office of Fusion Energy Sciences

www.ofes.fusion.doe.gov

Dr. N. Anne Davies
Associate Director
for Fusion Energy Sciences

March 5, 2003

FY 2004 Congressional Budget Request
Comparison to FY 2003 Congressional Budget Request

The President has decided the U.S. should join negotiations to build ITER to provide a sustained, burning plasma experiment

ITER ($12M for new direct expenses related to ITER participation, are redirected within the Science, Enabling R&D, and Facilities Operations subprograms)

Science ($144.7M, $+2.1M) (includes SBIR/STTR)

- Broad consensus that a burning plasma experiment is the next step (FESAC, NRC, SEAB)
- Conduct ITER-specific experiments on DIII-D and C-MOD
- Refocus SciDAC on an integrated simulation project supporting burning plasma physics
- Establish fusion plasma science "Centers of Excellence"
- Curtail international collaborations in order to support ITER
- QPS design efforts continue

Facilities Operations ($87.6M, $+9.1M)

- Operate 3 national facilities at 84% of full utilization
- Increase funding for NCSX MIE project, as planned, to complete final design and procure long lead items
- Support ITER transitional activities

Enabling R&D ($24.9M, $-11.2M)

- Focus plasma technology on needs of ITER
- Curtail longer range technology activities, in particular chamber technologies, in order to focus on directly supporting preparations for ITER construction and experiments
- Redirect FIRE and other advanced design efforts to ITER transitional activities

Fusion Program Elements Addressing ITER Needs

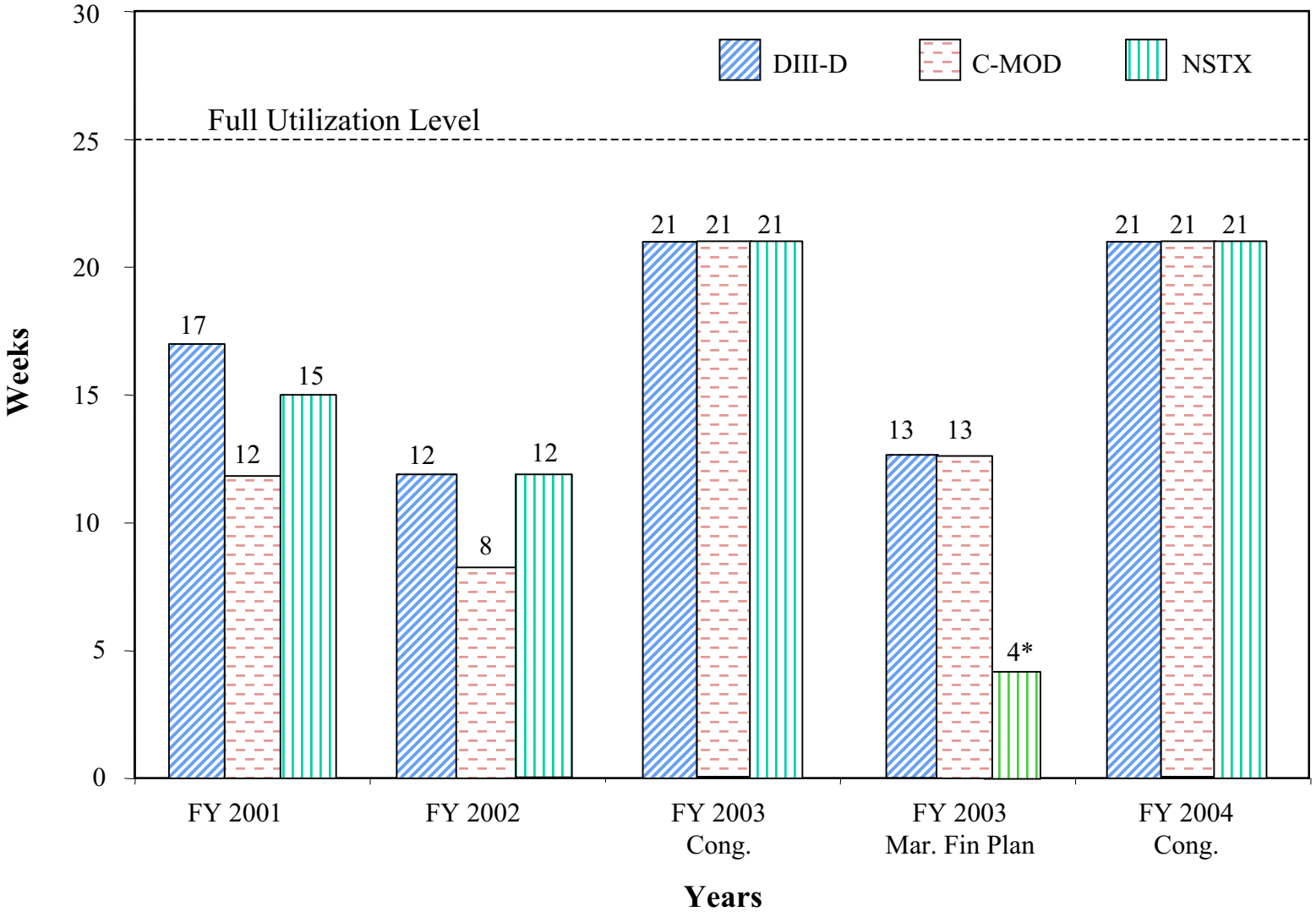
Elements	FY 2004 Resources
DIII-D Experimental Program	$5,000,000
Alcator C-Mod Experimental Program	2,000,000
Fusion Plasma Theory and Computation (SciDAC)	3,000,000
ITER Preparations	2,000,000
Total	*$12,000,000*

FY 2004 Fusion Energy Sciences Congressional Budget Request

	FY 2002	FY 2003 Cong.	FY 2003 Mar. Fin Plan	FY 2004 Cong.
Science	134.3	136.2	137.4	138.1
Facility Operations	70.8	78.6	66.2	87.7
Enabling R&D	36.0	36.1	37.1	24.9
SBIR/STTR	0.0	6.4	6.2	6.6
OFES Total	*241.1*	*257.3*	*246.9*	*257.3*
DIII-D	50.9	55.6	52.3	56.7
C-Mod	17.6	22.3	19.2	22.7
NSTX	28.0	33.1	30.4	35.2
NCSX	5.4*	11.8	11.7	16.6

*Operating Only

Major Fusion Facilities Operating Times



*NSTX operating time is reduced due to the failure of one of the magnetic coils in February. The coil will be repaired during the March-September timeframe.

03/03/03

Fusion Energy Sciences Budget by Institution

($ in Millions)

Institution	FY 2003 Congressional	FY 2003 Mar. Fin Plan	FY 2004 Congressional
General Atomics	48.3	46.5	49.6
Lawrence Berkeley National Lab	5.8	6.2	5.7
Lawrence Livermore National Lab	14.4	14.1	13.4
Los Alamos National Lab	7.3	6.8	3.8
Oak Ridge National Laboratory	19.3	20.5	18.7
Princeton Plasma Physics Lab	63.6	61.9*	70.6*
Massachusetts Institute of Technology	25.2	22.6	26.7
Other Universities	46.9	46.1	44.8
All Other	26.5	22.2	24.0
Total	***257.3***	***246.9***	***257.3***

*Includes $0.5M in FY 03 and $2M in FY 04 for ITER Transitional Activities, much of which will be passed through to as yet undetermined organizations

Fusion Energy Sciences University Funding

($ in Millions)

	FY 2003 Congressional	FY 2004 Congressional
Massachusetts Institute of Technology	25.2	26.7
Other Universities	46.9	44.8
Total University	***72.1***	***71.5***
By Subprogram		
Science	48.5	50.5
Facility Operations	12.8	14.0
Enabling R&D	10.8	7.0
Total Fusion Energy Sciences	***72.1***	***71.5***

Fusion Energy Sciences

(B/A in Millions)

	FY 02 Actual	FY 03 Cong.	FY 2003 Mar. FP	FY 2004 Cong.
Science				
Tokamak Experimental Research	45.4	55.0	53.5	52.9
DIII-D	23.7	22.7	24.0	23.3
Alcator C-MOD	7.5	8.5	7.3	8.5
International Tokamaks	4.4	4.4	4.7	3.2
Other	2.7	5.8	4.3	4.3
Tokamak Experimental Plasma Research	3.1	3.2	3.1	3.1
Diagnostics	4.0	4.0	3.9	3.9
SBIR/STTR (Science)	0.0	6.4	6.2	6.6
Alternative Concept Experimental Research	52.4	50.9	53.3	52.2
NSTX	12.8	13.7	14.2	16.0
MST	4.5	5.2	5.6	5.5
Experimental Plasma Research (Alts)	21.5	18.3	20.7	17.2
Inertial Fusion Energy (Science)	13.6	13.6	12.8	13.5
Theory	27.6	27.6	27.8	28.5
Fusion Plasma Theory	24.1	24.6	24.5	25.2
Advanced Computing	3.5	3.0	3.3	3.3
General Plasma Science	8.9	9.1	8.9	11.1
Subtotal Science	**134.3**	**142.6**	**143.5**	**144.7**
Facility Operations				
Tokamak Fusion Test Reactor	15.8	0.0	0.0	0.0
DIII-D	27.2	32.9	28.3	33.3
Alcator C-MOD	10.1	13.8	11.9	14.2
NSTX	15.2	19.4	16.2	19.2
NCSX	0.0	11.0	7.6	15.9
QPS MIE	0.0	0.0	0.0	0.0
GPP/GPE/ORNL Move	2.5	1.5	2.2	3.0
Burning Plasma Experiment	0.0	0.0	0.0	2.0
Subtotal Facility Operations	**70.8**	**78.6**	**66.2**	**87.6**
Enabling R&D				
Engineering Research	28.8	28.6	29.4	17.3
Plasma Technologies	12.0	12.1	12.3	14.0
Fusion Technologies	10.6	11.0	11.1	1.3
TSTA	3.0	3.0	2.9	0.0
MFE	5.1	5.4	5.0	0.8
IFE	2.5	2.6	3.2	0.5
Advanced Design and Analysis	6.2	5.5	6.0	2.0
MFE	5.1	5.3	5.0	2.0
IFE	1.1	0.2	1.0	0.0
Materials Research	7.2	7.6	7.6	7.6
Subtotal Enabling R&D	**36.0**	**36.1**	**37.1**	**24.9**
SBIR/STTR		[6.4]	[6.2]	[6.6]
Total Fusion Energy Sciences Program	**241.1**	**257.3**	**246.9**	**257.3**
Recap				
Tokamak Fusion Test Reactor	15.8	0.0	0.0	0.0
DIII-D	50.9	55.6	52.3	56.7
Alcator C-Mod	17.6	22.3	19.2	22.7
NSTX	28.0	33.1	30.4	35.2
NCSX	5.4	11.8	11.7	16.7
IFE	17.2	16.5	17.1	14.0
Science	13.6	13.8	12.8	13.5
Enabling R&D	3.6	2.8	4.2	0.5

Planned Solicitations for FY 2003

- NSF-DOE partnership
  - ~ $4M total for 2 agencies, under review
- Junior Investigator Program
  - 1-3 to be selected, under review
- Theory Program
  - ~$4M, closing date April 15, 2003
- Experimental ICC/Alternates
  - ~$6M, University/Industry, closing date May 1, 2003
  - ~$3M, Labs, closing date May 1, 2003

DOE This Month

U.S. DEPARTMENT OF ENERGY

FEBRUARY 2003

Department requests $23.4 billion for Fiscal Year 2004

Administration committed to hydrogen fuel for future

U.S. to join ITER negotiations

Secretary Abraham addresses employees at Princeton Plasma Physics Laboratory

DOE NEWS
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FOR IMMEDIATE RELEASE
Thursday, January 30, 2003

… MEDIA UPDATE …

The following is a statement by President Bush about ITER, a major international fusion project. Energy Secretary Abraham announced the President's decision that the U.S. will participate in the project in remarks today at the Department of Energy's Princeton Plasma Physics Laboratory. Secretary Abraham's prepared remarks are available at **www.energy.gov**

The White House
Office of the Press Secretary

For Immediate Release January 30, 2003

STATEMENT BY THE PRESIDENT

I am pleased to announce that the United States will join ITER, an ambitious international research project to harness the promise of fusion energy. The results of ITER will advance the effort to produce clean, safe, renewable, and commercially-available fusion energy by the middle of this century. Commercialization of fusion has the potential to dramatically improve America's energy security while significantly reducing air pollution and emissions of greenhouse gases.

The United States will be working with the United Kingdom, other European Union nations, Russia, China, Japan and Canada on the creation of ITER. Today, I am directing the Secretary of Energy to represent the United States at the upcoming ITER meetings in St. Petersburg, Russia. We welcome the opportunity to work with our partners to make fusion energy a reality.

###

ITER Negotiating Meeting in Russia now including China and U.S.

U.S. Delegation at ITER Negotiating Meeting in Russia (next to Academician Velikhov)

Status of Negotiations

- Advanced
  - Principally Governmental Issues
    - Intellectual Property Rights
    - Non Proliferation concerns
    - Privileges and Immunities
    - Site assessment –now completed: www.iter.org/jass
- Beginning
  - Principally Programmatic Issues
    - Procurement processes
    - Component allocations
    - Management approaches/tools

ITER Negotiating Structure

Agreement Preparation

- Exploratory Discussions
- Working Group
- Ad hoc topical groups

- Negotiations on Site, etc.

Project Preparation

(flows from Exploratory Discussions)

- Preparatory Committee (basis of future Council)
- ITA—ITER Transitional Arrangements (focus of technical and organizational work)

ITER Transitional Arrangements-1

- Technical Preparations (before site selection)
  - Maintain documented design basis of ITER
  - Prepare for procurement process (12 key systems: magnets, vacuum vessel, …)
  - Developing on a provisional basis ITER construction project management systems (tools)
  - Prepare licensing of ITER and undertaking necessary safety analyses (mitigation/licensing issues)
  - Execution of specific technical tasks at home (detailed design, analysis, testing and reviewing of wide variety of components/interfaces, etc.)

ITER Transitional Arrangements-2

- Organizational Tasks (before Site Selection)
  - Establish interim structures/bodies delineating key elements of ITER International Fusion Energy Organization
  - Coordinate each Participant's domestic arrangements for contributions to joint implementation
  - Identify potential senior staff
  - Elaborate administrative procedures and other administrative tools foreseen for managing ITER joint work (financial regulations, personnel matters, etc.)

Next Steps

- Toronto (April 8-17)
  - Clarington Site Visit - US 'experts' welcome
  - Process Discussion on Decision-Making
  - Topical Meetings - US 'experts' welcome
    - IPR principles
    - Management/Staffing
    - Procurement Issues
    - Decommissioning
  - Working Group - US 'experts' welcome
  - Addressing draft text
- Vienna (May 19-22)
  - Preparatory Committee
  - Exploratory Discussions
  - First Substantive Discussion on Decision-Making
- New York (September)
  - UN General Assembly (possible consensus among ITER Parties' senior officials on advancing ITER)

Immediate Tasks for Us Now

o Develop Paper on Risk and Cost	April 1
o Develop Papers on Procurement preferences and processes	April 1
o Develop Paper on Management Structure and Staffing	April 1
o Review draft texts (DOE/State)	March 21
o Join ITA* – Formal acceptance of invitation to participate – Determination of which tasks US might be able to take on – Identification of possible individuals to participate abroad – Involvement in focused meetings on organizational/technical topics	April 1

*Subject to availability of personnel and very limited funds in FY03

Need to Organize Now

- Two Phased Approach to Organization for ITER in U.S.
  - Phase 1: During ITA, before Construction starts
  - Phase 2: After ITA, during Construction
- Multi-institutional Team ASAP-Phase 1
  - Immediately: organize around people
  - In near future, revisit to see if more institutionally based organization is necessary
- For Phase 2, we will develop a Charter for ITER Project Office, consulting with FESAC

Principles for Charter of U.S. ITER Project Office to be Established for ITER Construction

DRAFT DRAFT

1. DOE will select an Institution to house the US ITER Project Office, which will work closely with OFES in implementing its duties.
2. Using the principles contained in this list a charter will be developed between the Institution and the Director, OFES for the conduct of the US ITER Project Office.
3. The Institution will provide for the service of key people to lead and staff this Office.
4. DOE will retain the right of concurrence/consultation on these key personnel assignments.
5. The Institution will incorporate individuals from the US fusion community to ensure a national, multi-institutional approach to this Office.
6. The Institution will provide the necessary administrative services, such as procurement, legal and financial activities.
7. The Institution will establish an advisory structure to assure community engagement and appropriate oversight of all aspects of the Office.
8. The US ITER Project Office will manage all aspects of the contributions made by the US to the ITER Organization, including secondment of US personnel.
9. For those components provided on an in-kind basis, the Office will act as the US project manager, working in close coordination with the performers.
10. For those components provided through contracts made directly with the ITER Organization, the Office will act as the US contact.
11. The Office, working closely with OFES, will coordinate the US fusion scientific activities conducted in support of the ITER Construction and preparation for operation.
12. The Office will represent the US in all technical and managerial meetings at the working level, supporting the DOE representatives as appropriate.
13. The Office and the Institution will be held accountable for the technical, cost and schedule achievements associated with the US contributions to the ITER Organization and for compliance with appropriate DOE project management requirements.
14. Periodic external reviews, organized by the DOE, will be made of the Office's and Institution's performance.

Immediate Actions

- Specifics for the Immediate Effort
  - Ned Sauthoff, with Charles Baker, will lead this effort, reporting to Michael Roberts in OFES
  - BP-PAC established by Ned, led by Stewart Prager, with broad participation to engage community in this effort, using FESAC recommendations as guide to the extent possible
  - Assist OFES in both technical and organizational preparations
  - All program participants asked to respond to Ned/Charlie, working with OFES program managers to resolve conflicts, if needed

ITPA is an Effective Channel for U.S. Involvement in ITER Physics

- International Tokamak Physics Activity (ITPA) has been effective for international collaborations on Burning Plasmas:
  - A large number of U.S. participants in ITPA
  - Ongoing work & meetings of Topical Physics Groups
  - Planning & implementation of joint experiments on ITPA high-priority research tasks
  - Update of Tokamak (ITER) Physics Basis publication
- ITPA is expected to continue at least another two years and contribute to ITER Physics
- The U.S. physics community should channel their interest in ITER physics through ITPA
- An ITPA/ITER Research Forum is being considered in the next months to provide an opportunity to discuss U.S. interests in ITER physics